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AS AMENDED

IN THE CLAIMS:

15. A method to increase throughput of a recovery boiler applicable to boilers with at least three air injection levels, the three levels being primary, secondary and tertiary air injection levels, or boilers that originally had two air injection levels that have been retrofitted with a third air injection level, the method comprising injecting oxygen at least at the secondary and the tertiary air injection levels, wherein the ratio of total oxygen to total combustion air at any air injection level is the oxygen enrichment concentration for that air injection level.

16. Method in accordance with claim 15 wherein the oxygen enrichment concentration is applied to the primary air injection level in addition to the secondary and tertiary air injection levels.

17. Method in accordance with claim 15 wherein recovery boiler has the same oxygen enrichment concentration in the secondary and tertiary air injection levels, the oxygen enrichment concentrations being greater than 21%.

18. Method in accordance with claim 15 wherein the recovery boiler has different oxygen enrichment concentrations in each air injection level, the oxygen enrichment concentrations being greater than 21% in each air injection level.

19. A method of increasing throughput of a recovery boiler applicable to boilers with at least four air injection levels, the four levels being primary, secondary, third and fourth air injection levels, the method comprising injecting oxygen at the

secondary air injection level and one or more of third and fourth air injection levels, wherein the ratio of total oxygen to total combustion air at any air injection level is the oxygen enrichment concentration for that air injection level.

20. Method in accordance with claim 19 wherein oxygen is injected at the primary air injection level in addition to the secondary and fourth air injection levels.

21. Method in accordance with claim 19 wherein the recovery boiler has the same oxygen enrichment concentrations in the primary, secondary and tertiary air injection levels, the oxygen enrichment concentrations being greater than 21%.

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22. Method in accordance with claim 19 wherein the recovery boiler has different oxygen enrichment concentrations in each air injection level, the oxygen enrichment concentrations being greater than 21% in each air injection level.

23. Method in accordance with claim 19 wherein the recovery boiler has oxygen enrichment concentrations up to 30% in the primary, secondary, and tertiary air injection levels.

24. Method in accordance with claim 19 wherein the recovery boiler has oxygen enrichment concentrations up to 30% in the primary, secondary, and third and fourth air injection levels.

25. A method of controlling oxygen concentration in flue gas of a recovery boiler, the method being applicable to boilers with at least three levels of air injection, or a recovery boiler with an original two level air injection system retrofitted to three air injection levels, the method including the steps of:

a) supplying oxygen flows to at least two air injection levels of the recovery boiler, the two air injection levels being different from the primary air injection level, for oxygen enrichment of the two air injection levels;

b) selecting a set point oxygen concentration

c) sensing the oxygen concentration in the flue gas;

d) adjusting the oxygen flow injected in the tertiary air injection level, in order to maintain the sensed oxygen concentration at about the set point oxygen concentration, while maintaining the flow of oxygen in the secondary air injection level constant.

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26. A method of controlling oxygen concentration in flue gas of a recovery boiler, the method being applicable to boilers with at least four levels of air injection, the method comprising the steps of:

a) supplying oxygen flows to at least two air injection levels of the recovery boiler, the two air injection levels being different from the primary air injection level, for oxygen enrichment of the two air injection levels;

b) selecting a desired set point oxygen concentration;

c) sensing the oxygen concentration in the flue gas;

d) adjusting the oxygen flow injected in the upper most air injection level, in order to maintain the sensed oxygen concentration at about the set point oxygen concentration, while maintaining the flow of oxygen in the other air injection level constant.

27. A method to improve combustion stability of a recovery boiler comprising the steps of:

a) supplying oxygen flows to the primary air injection level of the recovery boiler for oxygen enrichment of the primary air;

b) sensing the sulfur dioxide concentration in flue gas;

c) adjusting the oxygen flow injected in the primary air injection level in order to minimize sulfur dioxide emissions.

28. A method to improve combustion stability of a recovery boiler comprising the steps of:

a) sensing the sulfur dioxide concentration in the flue gas;

b) adjusting the oxygen flow injected in the secondary air injection level, in order to minimize the sulfur dioxide emissions.

29. Method in accordance with claim 28 wherein the oxygen enrichment concentration in each air injection level is controlled independently.

30. A method of controlling temperature profile in a recovery, the method including the steps of:

a) supplying oxygen flows to at least two air injection levels of the recovery boiler, the two air injection levels being different from the primary air level, for oxygen enrichment of the two air injection levels;

b) selecting a set point temperature profile;

c) sensing average temperatures at different levels of the boiler with an optical technique, and inferring a temperature profile to the boiler, adjusting the oxygen flow injected in the at least two air injection levels so that the measured temperature profile matches the boiler set point temperature profile.

31. A method to improve the chemical recovery of a recovery comprising the steps of:

a) supplying oxygen flows to the primary air injection level of the recovery boiler for oxygen enrichment of the primary air;

b) sensing the reduction efficiency of the smelt;

c) adjusting the oxygen flow injected in the primary air injection level, in order to obtain a reduction efficiency above 90%.

32. A method to improve the chemical recovery of a recovery comprising the steps of:

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a) sensing the reduction efficiency of the smelt;

b) adjusting the oxygen flow injected in the secondary air injection level, in order to obtain a reduction efficiency above 90%, wherein the ratio of total oxygen to total combustion air at any air injection level is the oxygen enrichment concentration for that air injection level.

33. Method in accordance with claim 32 wherein the oxygen enrichment concentration in each air injection level is controlled independently.